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SURGERY IN THE TREATMENT OF THE DISORDERS OF THE AUTONOMIC NERVOUS SYSTEM

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The literature concerning the autonomic nervous system has become so extensive that it would be impractical in a paper of this scope to present a comprehensive review. It would seem profitable, however, to outline the anatomy and physiology of the system with particular reference to the various clinical problems in order better to comprehend the surgical approach to their solution.

I. *Anatomy.*[1-5] The autonomic nervous system is composed of a series of ganglia, nerves and plexuses which have during the course of embryological development been moved out from the central nervous system. Its origin,[6,7] like that of the latter system, is now understood to be entirely ectodermal. From the viewpoint of comparative anatomy it can be recognized as by far the more primitive entity. Appropriately it innervates the glands, the heart, and the smooth muscle fibers of the viscera and blood vessels.

Like the more familiar voluntary nervous system, it is fundamentally segmental in nature. In both instances the individual segmental unit is the reflex arc. It will be remembered that the simplest voluntary reflex arc consists of two fibers, the afferent or sensory and the efferent or motor. The afferent fiber enters the spinal cord through the dorsal root of the spinal nerve. Its cell body lies in the ganglion of the dorsal root before it enters the spinal cord. Within the anterior horn of the spinal cord it communicates with the cell body of the efferent motor neurone which enters the spinal nerve by way of the anterior root.

The involuntary arc is similar to but not identical with the reflex system just described. It is composed not of two but of three fibers, one afferent and two efferent. Separated from the roots of each spinal nerve is a sympathetic ganglion, which is the unique and characteristic element of the autonomic nervous system. This ganglion is connected to the spinal nerve by the ramus communicans, which is composed of the gray unmyelinated ramus and the white myelinated ramus. The first of the three fibers of the visceral reflex arc is the visceral afferent or sensory fiber. Upon arriving from the periphery this fiber enters the sympathetic ganglion and then, being myelinated, it traverses the white ramus to the dorsal root of the spinal nerve. Not unlike the voluntary afferent fiber its cell body is located in the dorsal root ganglion. In the lateral horn of the cord it contacts the cell body of the second fiber of the visceral reflex arc, the preganglionic efferent fiber, which leaves the cord through the anterior root of the spinal nerve. This fiber is likewise myelinated and hence passes out through the white ramus from the central root to the sympathetic ganglion. Here it communicates with the cell body of the third element of the visceral arc, the postganglionic efferent fiber. This fiber is unmyelinated and hence returns by way of the gray ramus to the spinal nerve for ultimate distribution to the peripheral parts. In other words in its simplest form the reflex arc of the autonomic nervous system consists of (1) a visceral afferent fiber, (2) a visceral efferent preganglionic fiber, and (3) a visceral efferent postganglionic fiber.

Both afferent and efferent fibers may reach their respective goals either through the ordinary peripheral nerve trunks or through special sympathetic nerves, such as the three splanchnic nerves. Generally, however, with certain exceptions to be noted, the visceral afferent fiber and the preganglionic efferent fiber must pass through a sympathetic ganglion and its corresponding white ramus.

These basic anatomic facts, complicated as they unquestionably are, reduce the autonomic nervous system to its simplest terms. It should be realized, however, that in actual practice the autonomic nervous system is exceedingly complex. A typical reflex arc will often cover not one, but several segments. The sympathetic trunks, which run vertically through the neck, thorax and abdomen on either side of the vertebral column, join the ganglia together and carry the central communication between segments.

In the many peripheral plexuses and ganglia there are further innumerable intercommunications. It should be emphasized that the diffuse

spread of stimuli over several segments and widespread mass effects, not delicately coordinated, in contrast with the accurately governed voluntary responses, are a distinguishing feature of the autonomic nervous system. In most instances, nevertheless, the basic outline as given should suffice to clarify the usual surgical procedures.

II. *Physiology.*[2, 3, 5, 8, 9] Functionally three great subdivisions of the autonomic nervous system may be recognized. These subdivisions depend upon the origin of the preganglionic fibers. They are (1) the cranial autonomic system, whose preganglionic fibers issue from the third, seventh, ninth, tenth, and eleventh cranial nerves; (2) the thoracolumbar autonomic system, arising through the thoracic and upper lumbar spinal nerves; and (3) the sacral autonomic system, the fibers of which run in the visceral rami of the second, third, and fourth sacral nerves. There are no fibers arising in the cervical cord. The three cervical ganglia receive their preganglionic fibers from the thoracic segments and are an integral part of the thoracolumbar system.

The fibers of the thoracolumbar stream as previously described run by way of the white rami to the sympathetic trunk. The cranial and sacral fibers, however, having no analagous tract, proceed directly to the sympathetic plexuses of the periphery. Moreover, while the thoracolumbar preganglionic fibers terminate in the ganglia of the trunk, those of cranial and sacral origin have their endings in the terminal ganglia. It has been further demonstrated that the responses of the cranial and sacral subdivisions to drugs, such as atropine and epinephrine, while differing from that of the thoracolumbar system, are nevertheless similar to each other. It is customary therefore to speak of them together as the craniosacral autonomic system, as contrasted with the thoracolumbar autonomic system.

Generally physiologists speak of the thoracolumbar as the sympathetic system and the craniosacral as the parasympathetic system. Most structures innervated by the autonomic nervous system receive a double nerve supply with fibers from both subdivisions. Furthermore the parallel nerve supply from these two sources is usually of opposite function. There are, however, a limited number of organs that have only one set of innervating fibers.

The antagonistic function of the two systems is emphasized by their response to drugs.[10, 11] Epinephrine is effective by stimulating the sympathetic system, and physostigmine and pilocarpine by stimulating the parasympathetic. Atropine enhances sympathetic activity by paralysing the parasympathetic. In this connection it should be stressed that there are many inconsistencies in the response of the respective systems to these and to other drugs and hormones. Furthermore the response to a given substance may be altered strikingly by varying the dosage, even to the extent of producing a contrary effect.

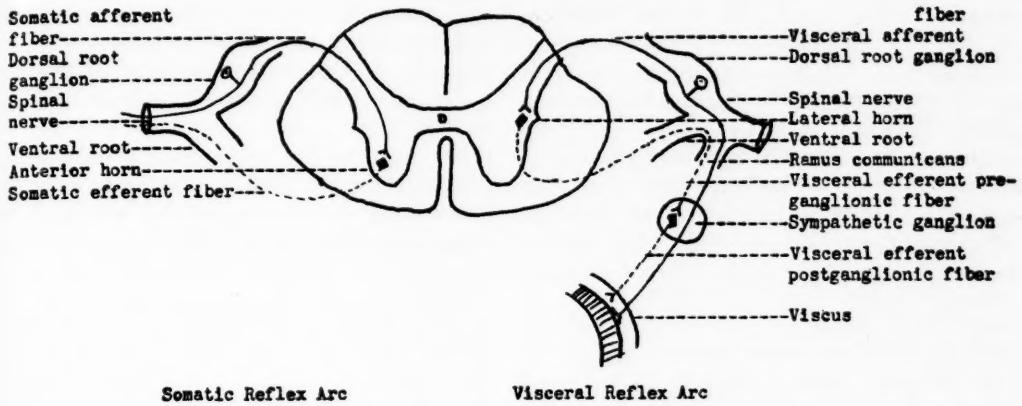
The more detailed pharmacology and physiology as revealed by Myerson and others[12-15] with the newer drugs such as mecholyl, benzedrine sulphate and prostigmin are very important, but are somewhat foreign to the present discussion. The same is true of the studies[16-21] on sympathin and acetylcholine (parasympathin) and on the chemical mediation of nerve impulses.

A brief outline, however, of some of the functions of the autonomic nervous system will be given. The sympathetic division, through the superior cervical ganglion, innervates the following structures in the eye: (1) the dilator muscle of the pupil, (2) the smooth muscle in the levator of the upper lid; and (3) the smooth muscle fibers at the back of the eye (called Müller's muscle) which are believed to push the orbit forward. Removal of the superior cervical ganglion, therefore, will result in a loss of function in these three structures with consequent pupillary construction, ptosis of the upper lid, and enophthalmos,—a triad known as Horner's syndrome.[22]

Certain cutaneous structures throughout the body are characteristically supplied by the sympathetic division. Activity of this division in the various segments results in (1) secretory function of the corresponding sweat glands,[23] (2) stimulation of the pilomotor muscles with resulting erection of the hairs, and (3) vasoconstriction of the peripheral arterioles, and probably of the capillaries. The effect of this activity is a cool moist skin, as observed typically in cases of Raynaud's disease.[24] Removal of sympathetic innervation, on the contrary, halts the secretion of the sweat glands and the vasoconstriction, resulting clinically in a warm dry skin.

The thoracic viscera are also innervated by the sympathetic division through the cervical ganglia. Activity of these fibers results in (1) acceleration of the heart with increased force of contraction, and (2) dilatation of the bronchi by inhibition of their smooth muscle.

SPINAL CORD (after Ranson).



In the abdomen the whole small and large intestine and to some extent the stomach are influenced by the sympathetic. The effect upon these organs is as follows: inhibition of the peristaltic movements, diminution in tone of the visceral musculature, and contraction and closure of the sphincters. In Hirschsprung's disease of the colon,—characterized by loss of tone and peristalsis, and marked dilatation—removal of the sympathetic innervation produces the opposite effect, namely increased tone and peristalsis with a consequent relief of symptoms.

Most of the blood vessels of the visceral area are supplied with vasoconstrictor fibers from this system. Much of the peripheral resistance which maintains the blood pressure level is produced in the splanchnic vascular bed. It follows then that stimulation of the splanchnic nerves results in an increase in blood pressure while their removal, such as has been done recently in hypertension, results in a lowering of the blood pressure.

Among pelvic organs receiving sympathetic supply is the urinary bladder. Stimulation of its sympathetic innervation results in contraction of the sphincter and relaxation of the detrusor or emptying muscle, an arrangement analogous to that in the gastrointestinal canal.

It has already been pointed out that parasympathetic control produces in general the opposite effect from that of sympathetic. The cranial portion through the vagus nerve depresses all activities of the heart — impulse formation, conductivity and contractility — with a resultant slowing of the heart and diminution in the force of its contraction. In the alimentary canal it increases motor activity and relaxes the sphincters. The cranial division produces in addition salivary gland activity.

The sacral division of the parasympathetic supplies motor fibers to the bladder and rectum. Stimulation results in contraction of the detrusor and relaxation of the sphincter muscle of the bladder with consequent emptying. In similar fashion it produces contraction of the musculature of the colon and rectum with dilatation of the sphincter ani internus and consequent evacuation of the lower bowel. The parasympathetic also controls erection of the penis.

Only a limited reference in the present discussion need be made to the afferent or sensory portion of the autonomic nervous system.[25] The broad subject of referred visceral pain is more closely allied to the problems of general medicine and surgery. A few types of visceral pain, however, such as angina pectoris and dysmenorrhea have been attacked directly. These will be discussed later.

III. *Historical.* Various anatomical observations of the autonomic nervous system have been made dating back to the description by Galen[26] in the second century of the paravertebral sympathetic ganglia. John Hunter[27] in 1776 suggested that the function of the nerve supply of the "involuntary parts" was to correlate their activity with that of the "voluntary" parts and with the mind. Bichat[28] in 1802 first suggested the term "vegetative nervous system." Claude Bernard's monumental researches[29] led him to the belief that the animal body became independent of its external environment only after developing a mechanism for maintaining the constancy of the internal environment.

This led to the remarkable studies in more recent years by Cannon[30, 31] on "physiological homeostasis," the adjustment of the body to its environment.

Bernard[32] in 1852 discovered that the control of radiation and storage of heat in the body is accomplished by means of vasodilatation and vasoconstriction through the mediation of the nervous system. He proceeded to demonstrate experimentally vasodilatation in the rabbit's ear following resection of the cervical sympathetic nerve. In 1862 Raynaud[24] described cases of "local asphyxia and symmetrical gangrene of the extremities" and suspected the role of the sympathetic nervous system as the source of vasomotor spasm.

Probably the first operations on the autonomic nervous system were carried out by Alexander[33] in 1889 and Jonnesco[34] in 1896. They both performed cervical sympathectomy in an attempt to cure epilepsy, but without success. Jaboulay[35] in 1899 performed a cervical sympathectomy to relieve Graves' disease, but this was likewise unsuccessful. In 1909 Eppinger and Hess[36, 37] first formulated the clinical conception of vagotonia and sympathicotonia. This work was important in drawing attention to the problems of autonomic unbalance and in providing an intelligible basis for the management of many of the functional visceral disorders.

Jonnesco[38] in 1916 performed the first successful cervico-thoracic sympathectomy for the relief of angina pectoris. Thus it was established beyond peradventure that visceral pain could be relieved by operations on the autonomic nervous system. About the same time Leriche[39] was demonstrating the possibility of relieving the pain in causalgias and of increasing the circulation in extremities by periarterial sympathectomy, that is removal of the adventitia from a peripheral artery. Periarterial sympathectomy although important as a landmark has now largely been replaced by other operations based on sounder anatomic principles.[40]

An added impetus was given to the cause of sympathetic surgery in 1924 by Hunter[41] and Royle[42] who advocated resection of the sympathetic rami to reduce the excessive muscle tone in spastic paralysis. Although the original purpose of the procedure was not accomplished, certain incidental observations of these workers have been of far-reaching importance. They revealed that the total loss of sympathetic impulses to a human extremity resulted in vasodilatation and the elimination of sweating, with consequent conversion of a cool, pale, moist extremity to one which is warm, pink and dry. These observations led directly to the treatment of Raynaud's disease and other vasospastic phenomena by operations on sympathetic nerves.

The same observers[43] in 1927 noticed that the removal of inhibiting fibers to the sphincters of the lower bowel resulted in increased motility. This suggested a new mode of attack on hitherto intractable forms of megacolon and obstipation.

While treatment by lumbar sympathectomy of vasospastic diseases of the lower extremity has been almost uniformly successful, the end-results[44-47] of cervico-dorsal sympathetic ganglionectomy for vascular spasm of the upper extremity have not until recently been satisfactory. While the immediate result was often excellent, the vascular spasm returned in the course of six months to a year. This could not be explained on the basis of regeneration of nerve fibers as Horner's syndrome and a complete sudomotor paralysis persisted.

Extensive experimentation has been carried out by Smithwick, White and others[48-53] to determine the cause of recurrence of vascular spasm after ganglionectomy. When the resection is sufficiently extensive the spasm may take only ten days to three weeks to develop. They have concluded that this type of vascular response is caused directly by the effect of circulating epinephrine on the vessel wall. As long ago as 1904 Meltzer and Auer[54] observed that twenty-four hours after removal on one side of the superior cervical ganglion in a rabbit a given dose of epinephrine produced a marked dilatation of the pupil and constriction of the vessels of the ear on that side, while on the normal side no effect was apparent. It has been shown in rabbits and monkeys that this epinephrine sensitivity is much less marked when the preganglionic vasoconstrictor neurons alone were severed, and the postganglionic fibers were left intact. Hampel[55] has shown in the nictitating membrane of the cat that smooth muscle denervated by degeneration of the postganglionic fibers is over twice as sensitive to epinephrine as it is after destruction of only the preganglionic portion of the sympathetic reflex arc. Cannon[56] has stated recently that the increased sensitiveness of denervated neurons very likely follows a general rule that "denervation of structures renders them more sensitive to their natural stimuli."

From these observations it has been concluded[50] that the return of vasospasm after ganglionectomy is caused by increased epinephrine sensitivity which results from degeneration of the postganglionic fibers whose cell bodies lie in these ganglia. It seemed paradoxical that the same phenomenon did not occur in the lower extremity when lumbar ganglionectomy was done. White[51, 50] has pointed out, however, that the postganglionic neurons to the sciatic nerve probably arise in the lowest lumbar and sacral ganglia. Removal of the second and third lumbar ganglia, such as is usually done for the lower extremity, probably results in a division of the preganglionic fibers which pass through them. Hence the degree of epinephrine sensitivity is of the lesser order which would be expected with a perganglionic sympathectomy.

Another field in which there has been considerable progress in recent years is in the surgical treatment of hypertention. Total denervation of the adrenals as advocated by Crile[57] and subtotal adrenalectomy described by DeCourcey[58] have been largely replaced by splanchnic nerve resection devised by Adson and others[59, 60] at the Mayo Clinic. Extensive rhizotomy,[61, 62] consisting of division of the anterior nerve roots from the sixth dorsal to the second lumbar, is likewise rational and effective. Because the latter procedure is much more formidable, however, only Heuer[62] and his co-workers continue to give it serious consideration. It is the purpose of both operations, splanchnic nerve resection and rhizotomy, to interrupt the vasoconstrictor nerve supply to the splanchnic vascular reservoir, which is of such great importance in governing the level of arterial pressures.

Another type of cases that has recently attracted considerable attention is that exhibiting the so-called carotid sinus syndrome described by Weiss and Baker[63] in 1933. These workers have separated from the large and ill-defined group of syncopes a subgroup showing certain well-defined clinical manifestations. Selected types of the carotid sinus reflex can be cured by surgical treatment in the way of denervation of the carotid sinus. These problems will be discussed later in more detail.

IV. *Clinical.* There is hardly opportunity in the present review to discuss in complete detail the clinical features of the various conditions under consideration. Emphasis will be placed rather on indications and methods of treatment.[64]

1. *Raynaud's Disease and Scleroderma.* The description of this entity as previously mentioned appeared in the year 1862.[24] It is preponderantly though not exclusively a disease of females. In the usual case there will be no abnormality of the peripheral arteries. The radial, posterior tibial and dorsalis pedis pulsations are readily felt. The obvious vasospasm is limited to the hands and feet with the greatest changes apparent in the fingers and toes. The changes are characterized by their symmetrical nature. There is a critical temperature below which vasospasm sets in. This varies with the intensity of the disease from 65 degrees in a mild case to as high as 80 degrees in a severe one.

The play of colors is one of the typical features of the disease. When the temperature drops below the critical level cyanosis appears, but rapidly disappears when the extremity is warmed. It may persist most of the time, however, in the more severe cases where the circulation is never fully restored. Later in the disease there may be attacks of dead white blanching. During the asphyxia the patient may suffer from numbness and pain which changes to burning and paresthesias during recovery from the attack.

Especially in the younger patients excessive sweating is a common complaint. This may be particularly annoying when they are excited or emotionally upset. It is now generally agreed[65, 66] that in the early stages of the disease there are no permanent changes in the vessels. Later, however, in the presence of chronic acrocyanosis[67] there have been demonstrated well-defined pathological changes in the way of obliterating endarteritis. Together with the vascular changes other structural and trophic alterations in the skin, nails, and bone may occur after prolonged and recurrent attacks. Late in the course of the disease the skin may become shiny and atrophic, and sclerosis of the subcutaneous tissues occurs. These are the characteristic changes of scleroderma.[68]

Treatment. The mild cases may be successfully treated by warm clothing such as woolen gloves and socks, or when possible by removal to a warmer climate. In the more severe cases, however, it will usually be necessary to resort to surgery. After ruling out other conditions such as Buerger's disease, arteriosclerosis and the cervical rib syndrome it is essential to perform tests to determine whether or not the case is a sutiable one for operation. In the more advanced cases organic changes in the

vessels may be so marked that there is little hope for improvement.

In order to test[5, 69-71] for the degree of vasospasm some form of skin thermocouple is essential for measuring skin temperatures. The extremity is permitted to reach a constant temperature in a room kept preferably at about 68 to 70 degrees Fahrenheit. Then either of two general methods may be applied to overcome any sympathetic activity present: (1) inhibition of the sympathetic tone by some physiological stimulus, or (2) procaine block of the peripheral nerves, or of the sympathetic ganglia or rami. Following this treatment the skin temperatures are again recorded. The temperature level approached is the average maximum vasodilator response for normal arteries taking 86.5 degrees Fahrenheit for the usual lower limit. In individual instances higher temperatures may be reached. A slight or minimal rise in temperature indicates absence of vasospasm, while a great or maximal rise indicates the presence of vasospasm.

Inhibition of the sympathetic tone may be accomplished by general anaesthesia, heating of the body, or foreign protein (typhoid vaccine) injection. Procaine block may be carried out as spinal anaesthesia, paravertebral block, or peripheral nerve block. The procaine block method is the simplest and most clearcut, and is the one that has come to be generally used. In the case of the lower extremity this may take the form of spinal anaesthesia or posterior tibial nerve block. In the case of the upper extremity it may take the form of paravertebral injection, or ulnar and median nerve block. Recently DeTakats[72-74] has described a somewhat different type of test using intravenous sodium nitrite together with oscillometer readings. This method has not yet been widely accepted.

After demonstrating the presence of a significant degree of vasospasm some form of operative treatment must be selected. For the lower extremities the operation of choice is abdominal lumbar sympathetic ganglionectomy as described by Adson and Brown[75-76] and others.[77-81] Exposure is through a lower midline incision. The left chain is approached by dividing the lateral leaf of sigmoid mesentery and retracting the sigmoid medialward. The chain can be identified lying beneath the aorta in the gutter between the psoas muscle and the vertebrae. The fourth to the second lumbar ganglia are resected comprising 6 to 8 cm. of the chain, measuring upward from the common iliac artery at its bifurcation from the aorta.

The right chain can be approached by an incision through the posterior peritoneum just lateral to the border of the vena cava. The trunk on this side bears the same relation to the vena cava and common iliac vein as that on the left does to the aorta and common iliac artery. Resection from this point is similar. The bilateral operation as described constitutes a preganglionic sympathectomy for the lower extremities.

The procedure of choice for the upper extremities is the dorsal preganglionic sympathectomy described recently by Smithwick[50, 77] and Telford.[81] The approach is through the vertical paramedian incision 6 cm. long, 3 cm. from the midline, centering opposite the second dorsal spine. The inner one inch of the third rib and corresponding transverse process are resected. Then the inner one and one-half inches of the second and third intercostal nerves are resected from the intervertebral foramen outward. The dorsal sympathetic trunk is identified and it is divided below the third dorsal ganglion. The proximal free end of the trunk is sutured to the muscles to prevent regeneration. Kuntz[82, 83] has recently inferred from animal studies that appreciable numbers of sympathetic fibers to the upper extremity pass over the first dorsal nerve which is left intact in this operation. From studies on the monkey by White and from his own clinical results, however, Smithwick[50] has concluded that such fibers as may be present in the first dorsal nerve are not significant. This is of considerable importance because section of the first dorsal nerve would produce motor and sensory paraylsis of the arm. It may be further added that after this new type of sympathectomy, no Horner's syndrome is produced. The procedure when carried out in the manner described constitutes in all probability a preganglionic dorsal sympathectomy, leaving the postganglionic fibers intact. After a period of recovery a similar operation may be performed for the remaining side.

In occasional instances vasospasm in the extremities may be controlled by dorsal and lumbar paravertebral injection of alcohol.[5, 84] Under most circumstances, however, this is not to be recommended as recurrences after six months are not unusual.

2. *Thrombo-angiitis Obliterans (Buerger).* The clinical manifestations and basic treatment of this disease have been discussed elsewhere.[85, 86] We are concerned in the present instance chiefly with the associated vasospastic phenomena. There is no doubt that the inflammatory changes occurring both

in the arteries and in the veins as originally pointed out by Buerger constitute the underlying pathological process. There is very often, however, an appreciable amount of vasoconstrictor spasm superimposed on the obliterative lesion. This affects not only the primary circulation but the collateral as well. It seems obvious that the attainment of maximal vasodilatation under such circumstances should produce salutary effects.

Treatment. In general surgical procedures are not indicated in mild cases or when medical measures are effective. The degree of vasospasm can be determined by the methods already outlined for Raynaud's disease. In the present instance, however, a different approach to the problem of treatment is indicated. It will be remembered that the peripheral nerves carry in addition to the sensory components the efferent vasoconstrictor fibers. By properly selecting the level of exposure these nerves can be blocked without causing any perceptible motor involvement. It is thus possible when dealing with the lower extremity to accomplish in addition to the vasodilatation the elimination of pain which in itself is so often a prominent complaint. Not infrequently the pain alone may be sufficient indication for the operation.

In 1922 Silbert[87] first proposed alcohol injection of the posterior tibial nerve for the relief of intractable pain in thrombo-angiitis obliterans. Almost ten years later Smithwick and White[88] devised a method for complete denervation of the foot by alcohol injection of all the nerves. In 1933 Laskey and Silbert[89] advocated section and immediate suture of the nerves as being safer and more satisfactory than alcohol injection; they have continued to use this method.

The operation to be recommended, however, is that of nerve-crushing more recently described by Smithwick and White.[90] The nerves are exposed through short vertical incisions and are crushed with a hemostat for a distance of ¼ to ½ inch, depending upon the desired duration of anaesthesia. A meticulous atraumatic technique is essential and the operation must never be done in the presence of lymphangitis. Localized areas of gangrene in the toes, however, are not a contraindication. In order to completely denervate and sympathectomize the foot five nerves must be crushed.. It is generally advisable to block all of these nerves. The optimum level at which to accomplish this is at the junction of the middle and lower thirds of the leg. This will include all collateral branches, but at the same time avoid any important motor involvement. The five nerves are as follows: (1) superficial peroneal, (2) deep peroneal, (3) sural, (4) posterior tibial, and (5) saphenous.

Nerve regeneration with return of sensation and vascular tone can be expected in three to six months after this treatment. Trophic ulcers due to the loss of sensation are very rare. If there is a concomitant return of pain or vasospasm the nerves can be crushed again for an additional period. If it seems desirable after the return of nerve function to produce prolonged vasodilatation, this may be accomplished by a lumbar sympathectomy,[91-97] differing in no wise from that described for Raynaud's disease. Nerve crushing is not of course applicable to the vasospasm of the upper extremity. A preganglionic dorsal sympathectomy[50] may be indicated in such cases.

3. *Essential Hyperhidrosis.* There are a number of individuals suffering from mild sympathetic imbalance who are troubled more by the excessive sweating than by any slight coolness or discoloration of the extremity. Some of these persons are so inconvenienced by their affliction that they are unable to seek employment or to carry out social obligations. Embarrassment or emotional strain may lead to a marked secretion of perspiration even to the extent of its dripping from the hands and feet. This is especially distressing in occupations where the hands are under scrutiny or where books, papers and fabrics must be handled.

Treatment. Preganglionic sympathectomy by the methods previously described is a most satisfactory treatment,[23, 98-100] and is peculiarly gratifying to the patient. The extremities become warm and permanently dry. It is usually necessary in fact to recommend the application of hydrous wool fat ointment in order to preserve the suppleness of the skin.

4. *Chronic Rheumatoid Arthritis.* Patients suffering from this disease often exhibit cold, wet, clammy skin over their hands and feet. Where this is present distinct benefit may result from sympathectomy.[84, 101] It is exceedingly doubtful, however, whether the joints will be affected to any appreciable extent, especially in the presence of actual deformity.

5. *Infantile Paralysis.* Cold cyanotic extremities with excessive perspiration are frequently encountered in poliomyelitis.[102, 103] Sympathectomy may give considerable relief under these circumstances.[78]

Recent work by Harris and McDonald[102] indicates that even growth and development of the affected extremity may be stimulated.

Treatment. In this connection it should be noted that where a unilateral lumbar ganglionectomy alone is indicated it may be carried out through a posterior approach.[5] The patient is placed in the lateral kidney position. The incision starts at the lower border of the twelfth rib at the outer edge of the sacrospinalis muscle and parallels this structure to the crest of the ilium. Then it curves forward along the brim of the pelvis for 5 to 10 cm. The lumbodorsal fascia is divided and the oblique and transverse abdominal muscles separated from the latissimus dorsi, sacrospinalis and quadratus lumborum. This separation may be facilitated by entering the triangle of Petit. The muscles are separated from the loose retroperitoneal tissues. The peritoneum and ureter are retracted forward and medialward until the vena cava and aorta or iliac arteries are exposed. The lumbar sympathetic chain will then be found in the same relation to these structures as in the anterior approach. After resection the wound should be carefully repaired in layers.

6. *Erythrocyanosis, associated with Chronic Chilblains.*[104, 105] This condition, occurring typically in young women, is distinguished by a reddish-blue discoloration, generally of the lower half of the leg. The color blanches on pressure, but returns quickly from all sides with dark blood. The subcutaneous tissues are thickened, and nodules develop which may heal by cicatrization or form indolent ulcers. Telford and Simmons[105] reported ten cases in which lumbar ganglionectomy provided relief from the symptoms and arrested the progressive scarring. Ross[78] found likewise that operation produced a warm pink skin in all uncomplicated cases, but would not prevent the recurrence of ulceration.

7. *Traumatic Vasometer Neuroses and Causalgia.* Observations[86, 106] made during the world war have emphasized the importance of peripheral angiospasms secondary to trauma or to involvement of peripheral nerves. The latter especially are characterized by varying degrees of localized hyperesthesia and burning pain and are known as causalgias.[106]

Treatment. Every effort should be made to remove local sources of irritation, such as scar tissue about nerves, and to improve the condition of the extremity with physiotherapy. When these measures fail tests should be carried out with procaine, as previously outlined, to ascertain the possibilities of benefit from sympathectomy. In favorable cases relief both from the vasospastic and from the sensory complaints may be expected.[78] The operations are those already described.

8. *Idiopathic Megacolon (Hirschsprung).* There is a definite group of primary enlargements of the colon having a neurogenic origin. The typical cases are characterized by an obstinate constipation beginning at birth or in early childhood together with a progressive abdominal distention. The disease may occasionally be discovered in adults. The etiologic factor is an imbalance of the autonomic mechanism controlling the lower half of the large intestine. Removal of the inhibiting sympathetic activity as originally advocated by Wade and Royle[43] in 1927 often produces striking improvement[78] in bowel activity.

Treatment. After the usual medical regimen has been given a thorough trial, a fairly conclusive test may be carried out to determine the efficacy of surgical intervention. Spinal anaesthesia offers a convenient means of blocking the sympathetic supply. Combined with a barium enema it will furnish a graphic demonstration of the effectiveness of sympathetic denervation. In the milder cases spinal anaesthesia followed by adequate medical treatment may of itself result in restoration of bowel function without the necessity of subsequent operative interference.[107]

In order to completely rule out a mechanical obstruction, sympathectomy for this condition is performed preferably through an abdominal incision. Rank and Learmonth[108] advocated resection of the superior hypogastric plexus together with the inferior mesenteric plexus which surrounds the inferior mesenteric artery. White[5] points out, however, that it is exceedingly difficult to thoroughly remove the plexus about the inferior mesenteric artery. Furthermore in males removal of the superior hypogastric plexus causes a loss of power to ejaculate. He recommends *bilateral* lumbar ganglienectomy, as already described for the vascular conditions, as being reasonably effective and without these handicaps. In females, however, there is no objection to the first mentioned operation, which should be combined with a left lumbar ganglionectomy to assure an effective resection.

9. *Dysmenorrhea.* As pointed out by Counsellor and Craig[109] the cases of dysmenorrhea should be divided into two groups, those without any associ-

ated pelvic pathology and those presenting related pelvic surgical conditions which may add to the symptoms. The primary etiologic factor in the first group is a disturbance in the pelvic sympathetic nervous system. This may be corrected by resection without disturbing in the least the normal functions of menstruation and childbirth.

Treatment. Operation is indicated in both the primary and secondary groups, but only after medical and non-operative measures have failed to give adequate relief. The effective procedure is resection of the superior hypogastric plexus, the so-called presacral nerve. The approach[5, 112] is through a left paramedian incision from above the umbilicus almost to the pubis. With the patient in Trendelenburg position the posterior peritoneum is opened from a point 2 cm. above the bifurcation of the aorta to a point 5 cm. below. The nerves lie in a delicate plexus of pelvic lymphatics and loose connective tissue. All of the tissue in the hollow of the sacrum between the two iliac arteries is cleaned out by blunt dissection. This procedure requires delicate technique and careful hemostasis. At the same laparotomy any associated gynecologic disorder may be corrected surgically.

The results[109-116] of this operation are particularly gratifying and complete relief can be expected in a very high percentage of cases.

10. *Pelvic Malignancy.* Although the results[51, 112] are not as consistent as in the preceding group of cases, presacral neurectomy may nevertheless be expected to relieve pain in some instances. Lahey and Cattell[117] advocate resection of the presacral nerve in extensive tumors of the rectum whether operable or not as a prophylactic measure at the time of exploration. A number of gynecologists now combine this same procedure with hysterectomy for ovarian or uterine carcinoma, or perform it alone where the primary condition is inoperable. Because of extension to higher levels, however, it becomes necessary in some patients to perform intraspinal alcohol injections[118] or cordotomy if adequate relief from pain is to be obtained.

11. *Angina Pectoris.* The operative treatment is based on the procedure devised and first successfully used by Jonnesco[38] in 1916. This consisted in complete cervical sympathectomy, including particularly the stellate ganglia. The operation was intended to abolish afferent impulses from the heart passing through sensory fibers which accompany the cervical sympathetic and its rami communicantes. Various modifications and variations of this procedure have been used, but it is now largely in discard because of the uncertainty of results and the definite mortality which it carries in these patients who are often poor surgical risks.[4, 5, 51] Total thyroidectomy as proposed by Blumgart, Levine and Berlin[119] likewise seems to have lost much of its early promise.

Treatment. Much safer, simpler and more consistent is the method of paravertebral alcohol injection first suggested by Swetlow[120] in 1926. White[5, 51] and Smithwick[77] have both reported success with this method and believe it to be the treatment of choice.

The purpose of the injection is to distribute 3 to 5 c.c. of 95 percent alcohol at each of the upper dorsal segments. This is said to result in destruction of the communicating rami rather than of the main trunk or its ganglia. With the patient lying on the contralateral side with knees drawn up 8 to 10 cm. needles are inserted vertically about 4 cm. lateral to the spinous processes of the last cervical and upper three dorsal vertebrae until contact is made with the corresponding ribs. The needles are then directed downward and inward at an angle of 45 degrees passing below the lower border of the ribs. They are then inserted 3 to 4 cm. deeper where contact is made with the bodies of the vertebrae. The points are now near the communicating rami. Great care must be taken to avoid damage to the lung or pleura; and aspiration should be done to make certain that the tip of the needle is not in a blood vessel or in the subarachnoid space. 2 c.c. of 2 percent procaine-epinephrine solutions is then injected into each needle. If the needles are properly placed a Horner's syndrome in addition to well defined areas of anaesthesia and vasodilation should appear. The proper amount of alcohol may then be injected.

The majority of patients respond to the left-sided procedure alone. In those cases where this is not sufficient the right side may also be done several weeks later as a second stage. When the treatment is carefully performed it will yield excellent results with infrequent complications. It may be useful also in relieving the pain of aortic aneurysm.[121]

12. *Hypertension.* For purposes of discussion cases of hypertension may be separated broadly into two groups, the primary or essential type and the secondary.[122] Secondary hypertension occurs typically as a consequence of renal disease. We shall be

concerned in the present instance chiefly with essential hypertension. This condition is characterized by an abnormally high blood pressure which under the stimulus of excitement or physical strain may rise suddenly to high peaks. The disease may develop in any age groups from the first decade on. A distinct family tendency seems evident. Progress of the disease results in retinitis, retinal hemorrhages, papilledema, sclerosis of the vascular system, coronary occlusion, myocarditis, nephritis, cerebral degeneration and cerebral vascular accidents.

Depending upon the rate of progress and the severity of the symptoms essential hypertension may be classified as benign or malignant. The benign type affects persons in the older age groups. The course is moderately rapid and the life expectancy is ten to fifteen years. The malignant type affects younger persons. Here the disease is manifest by a rapidly progressive course and the life expectancy may be barely eighteen months.

Although the etiology of hypertension is still obscure it seems fairly well established that the elevation of blood pressure is caused by increased resistance to blood flow through the arterioles.[122-126] In the early stages of the disease the increased arteriolar tone results from vasomotor stimuli arising in cerebral centers and travelling over sympathetic pathways to the arterioles.

The arteriolar spasm can be demonstrated early in the course of the disease by the cold pressor test.[126] The blood pressure is first taken under control conditions. Then with one hand in ice water the blood pressure is taken in the opposite arm. The rise for normal individuals averages 8 mm. for both systolic and diastolic pressures. In hypertensives the systolic rise averages 37 mm. and the diastolic rise 25 mm., but may be considerably greater. It is of interest to note that the children of parents who have hypertension frequently exhibit an exaggerated response to the cold pressor test.

Operations on the sympathetic nervous system have three apparent purposes:[126]

(1). To decrease resistance to the flow of blood through a large vascular area located within the abdomen. Previous experience in peripheral vasospasm has demonstrated that sympathectomy can reduce arteriolar resistance.

(2). To decrease the discharge of epinephrine from the adrenal medulla.[127, 128] Although the adrenal gland is not important in the pathogenesis of essential hypertension, release of epinephrine as a result of emotional and physical strain does contribute to the elevation in blood pressure occurring in such episodes.

(3). To increase the flow of blood through the kidneys. Goldblatt[129] and others have produced in animals an hypertension closely simulating essential hypertension by placing a clamp on the renal arteries to diminish circulation to the kidneys. It would seem advisable in view of this evidence to increase the bloodflow to the kidneys, even though it can scarcely be said that impairment of renal circulation has been demonstrated as the mechanism producing essential hypertension.

Treatment.[126] At the present time operative intervention should be considered only where the hypertension has been progressive despite adequate medical supervision. Of importance in this connection is the rate of progress of the disease, the response to medical treatment, the age of the patient, and the extent of cardiovascular and renal impairment. The best results will follow when the symptoms are still mild and there is definite evidence of an unstable blood pressure.

Adson[126] lists the criteria for surgical treatment as follows:

(1). When examination reveals an essential hypertension which is progressive and is associated with persistent headaches;

(2). When the blood pressure drops with the patient at rest and under pentothal anaesthesia;

(3). When there is retinal arterial spasm with little sclerosis;

(4). When the duration of the hypertension is short, if it is of the malignant type;

(5). Before cardiac and renal injury have taken place.

Contraindications[130] for operation are:

(1). Age greater than fifty years,

(2). Congestive heart failure,

(3). Angina pectoris,

(4). Marked renal insufficiency,

(5). Advanced arteriosclerosis.

Several different procedures are being used at the present time to interrupt sympathetic stimuli to the vascular bed. Of these three are especially prominent. Since standardization in this field has not yet been attained it seems desirable to outline the three methods.

(1). Bilateral division of the anterior nerve roots from the sixth dorsal to the second lumbar spinal nerve.[61, 62, 126, 131] This is described by Heuer as rhizotomy.

(2). Subdiaphragmatic resection of the splanchnic nerves combined with resection of the lower end of the thoracic trunk and the first and second lumbar ganglia. This is the method advocated by Adson.[59, 60, 130, 132-136]

(3). Extrapleural intrathoracic resection of the splanchnic nerves together with the tenth and twelfth dorsal ganglia. This method has recently been described by Smithwick.[77]

Extensive rhizotomy is carried out in the following manner. With the patient under general anaesthesia laminectomy is done from the first lumbar up to and including the sixth dorsal vertebra. The dura is opened for the full extent of the bony defect, and the proper nerves are identified. Beginning at either end the dentate ligaments are divided and are used to rotate the cord, thus bringing the anterior roots into view. These are identified and are divided between ligatures. The dura and overlying tissues are then closed in layers. Neurosurgical silk technique should be used throughout. The fibers interrupted are largely preganglionic. The procedure may be divided into two stages when the reaction of the patient demands caution. Care must be taken to avoid traumatic myelitis. This operation results in paralysis of the abdominal muscles and is certainly the most formidable and time-consuming of those proposed for hypertension.

Subdiaphragmatic splanchnicectomy is a bilateral operation and should be done in two stages. It is carried out with the patient in the kidney position. A hockey stick incision is made just lateral to the erector spinae muscle extending downward and forward over Petit's triangle just above the crest of the ilium. The external and internal oblique and the transversus abdominal muscles are divided. The twelfth rib is resected subperiosteally. The subcostal ligament of the twelfth rib is then incised, allowing upward retraction of the intercostal vessels and nerves and affording good exposure of the splanchnic nerves and lumbar ganglia. The liver and perinephric fatty capsule are displaced forward. The peritoneum and its contents are carefully protected. Gentle dissection reveals first a splanchnic trunk composed of major, minor and lesser splanchnic nerves, which are about 2 cm. in length and end in the celiac ganglion. The resection includes a few millimeters of this ganglion together with the splanchnic nerves. The first and second lumbar ganglia are exposed and removed with the intervening trunk. Adson combines this procedure with resection of the outer or distal one-half of each adrenal gland. This operation interferes with ejaculation in the male, and also sympathectomizes the lower extremities with resulting vasodilatation and absence of sweating.

Bilateral splanchnic resection by the intrathoracic extrapleural route proposed by Smithwick is performed as follows. The inner inch of the eleventh rib is resected, together with the corresponding intercostal vessels and muscles. The three splanchnic nerves together with the lower portion of the thoracic sympathetic trunk, the tenth to the twelfth dorsal, are widely resected. The bilateral resection should be carried out in two stages. This procedure may be performed with equal facility in fat or thin individuals, carries little risk and disability, and is followed by no unfavorable sequelae. The resection is largely preganglionic and probably denervates the adrenal glands as effectively as any other operation. Smithwick believes that "from the point of view of technical facility, this operation has obvious advantages over the lumbar subdiaphragmatic approach, and is anatomically and physiologically equally sound."

These various procedures have been equally encouraging in the way of relieving severe subjective symptoms and in lowering the blood pressure in approximately one-half of the cases. It is too early, however, to decide whether the reduction in blood pressure is lasting and whether there is actually prolongation of life.[137]

13. *The Carotid Sinus Syndrome.* In 1933 Weiss and Baker[63] demonstrated that an abnormally sensitive carotid sinus mechanism can be responsible for recurrent attacks of syncope and convulsions. They were able to reproduce such attacks by pressure over one carotid sinus. The attacks of unconsciousness, with or without convulsions, may occur at intervals varying from days to months. An attack is often preceded by sensations of dizziness, weakness, ringing in the ears or epigastric distress. Unconsciousness lasts from one to three minutes, and the patient usually feels well after recovery except possibly for some headache or dizziness. The attacks may be related to sudden movements of the head or neck, or to pressure upon the latter. Often fatigue or emotional upset may bring on an attack. For purposes of diagnosis the attack can be reproduced with regularity by mechanical stimulation of the carotid sinus. Blocking of the sinus with procaine abolishes the effects of stimulation. The response of the carotid sinus in epileptics is normal.

Three separate mechanisms for the attacks of syncope have been recognized:[138, 139]

(1). Vagal reflex, resulting in slowing of the heart;

(2). Vasomotor reflex, resulting in a fall in blood pressure independent of the heart;

(3). Cerebral reflex, which may cause syncope and convulsions without significant alterations in the blood pressure or pulse rate.

Treatment. The vagal reflex can usually be abolished by suitable doses of atropine. Judicious use of ephedrine and epinephrine may control the vasomotor type of reaction. The cerebral type, however, is not benefited by drugs.

In the case of the cerebral reflex, or in those cases with the vasomotor or vagal reflex when drug therapy has not been successful, a very high proportion of cures may be expected from surgical denervation of the carotid sinus.

Carotid sinus denervation as described by Munro[138] may be carried out in the following manner. A 3 inch incision is made along the anterior border of the sternomastoid muscle, with its center opposite the cricoid cartilage. The platysma and superior cervical fascia are divided. The sternomastoid muscle is retracted laterally, exposing the upper end of the carotid sheath. The internal jugular vein is retracted medially and the common carotid is exposed by dividing the sheath. The internal and the external carotid arteries and the bifurcation are then exposed and stripped. The stripping should include the intercarotid tissue and the adventitia all the way around both carotid trunks for a distance of 2 cm. above the bifurcation. Care must be taken to avoid injury to the carotid artery.

Generally a unilateral operation upon the most sensitive side is adequate, but in some instances a bilateral procedure must be done for complete relief.[138, 140-142]

14. *Miscellaneous.* Recent observations indicate that an appropriate sympathectomy may be a useful adjunct also in the treatment of facial paralysis,[143] of vasospasm associated with acute arterial embolism[144, 145] and of certain types of renal pain.[146] In another considerable group of conditions for which such operations have been proposed careful clinical and physiological appraisal of the results has been discouraging.[5, 40, 51, 78] Among these are bronchial asthma, cord bladder, bladder pain, epilepsy, spastic paraplegia, cardiospasm, peptic ulcer and retinitis pigmentosa.

In view of the vital and pervasive influences of this physiological system the progress to date which has been recorded herein can be regarded as barely more than a beginning. With the active interest and intelligent effort which is now so generally in evidence, however, it is only reasonable to anticipate further important achievements.

Summary

1. *Anatomy.* The autonomic nervous system is an aggregation of nerves and ganglia which have been displaced from the central nervous system for the purpose of governing the involuntary activities of the body. The essential unit of this system is the visceral reflex arc consisting of three elements: (1) a visceral afferent fiber, (2) a visceral efferent preganglionic fiber, and (3) a visceral efferent postganglionic fiber. The sympathetic ganglia, trunks and rami provide the paths for intersegmental communications.

2. *Physiology.* The autonomic nervous system is divided into the thoracolumbar or sympathetic division and the craniosacral or parasympathetic division. Most structures innervated by the autonomic nervous system receive from the two divisions a parallel supply having opposite functions. The antagonistic effect is emphasized by the response to drugs.

3. *Historical.* Jaboulay, Leriche, Jonnesco, and Hunter and Royle were the pioneers in the development of the surgery of the autonomic nervous system.

4. *Clinical.* The disorders which have responded to surgical procedures upon the autonomic nervous system are as follows:

(1) Raynaud's Disease and Sclerodema.
Upper Extremity: Preganglionic dorsal sympathectomy.
Lower Extremity: Lumbar sympathetic ganglionectomy.

(2) Thrombo-angiitis Obliterans.
Upper Extremity: Preganglionic dorsal sympathectomy.
Lower Extremity: Nerve crushing, or Lumbar sympathetic ganglionectomy.

(3) Essential Hyperhidrosis.
Upper Extremity: Preganglionic dorsal sympathectomy.
Lower Extremity: Lumbar sympathetic ganglionectomy.

(4) Chronic Rheumatoid Arthritis: Vasospasm and sweating.
Upper Extremity: Preganglionic dorsal sympathectomy.
Lower Extremity: Lumbar sympathetic ganglionectomy.

(5) Infantile Paralysis: Vasospasm and sweating.
Upper Extremity: Preganglionic dorsal sympathectomy.
Lower Extremity: Lumbar sympathetic ganglionectomy.

(6) Erthrocyanosis associated with Chronic Chilblains.
Lumbar sympathetic ganglionectomy.

(7) Traumatic Vasomotor Neuroses and Causalgia.
Upper Extremity: Preganglionic dorsal sympathectomy.
Lower Extremity: Lumbar sympathetic ganglionectomy.

(8) Idiopathic Megacolon.
Both sexes: Bilateral lumbar sympathetic ganglionectomy, or
Females: Resection of the superior hypogastric and inferior mesenteric plexuses together with a left lumbar sympathetic ganglionectomy.

(9) Dysmenorrhea.
Resection of the superior hypogastric plexus (presacral nerve).

(10) Pelvic Malignancy.
Resection of the superior hypogastric plexus.

(11) Angina Pectoris.
Paravertebral alcohol injection, first four dorsal segments; left or bilateral.

(12) Essential Hypertension.
Extensive bilateral hrizotomy, or
Bilateral subdiaphragmatic splanchnicectomy combined with resection of the lower thoracic trunk and first and second lumbar ganglia, or
Bilateral extrapleural intrathoracic splanchnicectomy combined with resection of the tenth or the twelfth dorsal ganglia.

(13) Carotid Sinus Syndrome.
Unilateral or bilateral resection of the carotid sinus nerve.

(14) Miscellaneous.
Facial paralysis.
Vasospasm associated with arterial embolism.
Certain types of renal pain.

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THE PRODUCT OF A HOSPITAL

Some thirty years ago, Dr. E. A. Codman advanced the claim that the results of the work of a hospital should be considered with the same attention as is given to the product of a manufactory or other business enterprise. On one side of the ledger is the expense per day's treatment; on the other the results of treatment as indicated by the proportion of patients who recover.

During the past thirty years the cost per day of hospital treatment has increased steadily up to three and a third times the earlier figure. Breaking down the statistics into ten year periods, the greatest increase appears in the 1919-1928 decade, during which the daily cost of treatment doubled. In this decade there was a slight increase in the proportion of surgical cases, a regular increase in the work of the pathological laboratories, a regular increase in the number of out-patients. The number of patients per resident was unchanged; the number of patients per nurse diminished by 25%, indicating a proportionate improvement in nursing care. In the same period there was an extension of scientific methods of diagnosis, and a great expansion of the X-ray and physiotherapy departments.

In spite of the improved methods of diagnosis and treatment, the improvement in nursing, diminished maternal mortality, and freedom from the mortality of diphtheria, typhoid fever and the diarrhoeal diseases of childhood, some of our hospitals now show no such improvement in mortality statistics as would seem to justify the increased expense of hospital treatment. We offer as a topic for discussion the question as to whether these hospitals should be fairly judged by the height of their buildings, the magnificence of their operating equipment, the number of their X-ray machines, the extent of their laboratories, or by their success or failure in the treatment of disease.

ARTHUR HUDSON HARRINGTON, A.B., M.D.

An Appreciation

WALTER LEE MUNRO, M.D.
413 LLOYD AVENUE, PROVIDENCE

In the death of Dr. Arthur Hudson Harrington, formerly Superintendent of the State Hospital for Mental Diseases, on Sunday, March 12, 1939, the State of Rhode Island lost one of its foremost citizens, one of its wisest and most far-seeing humanitarians.

Dr. Harrington was one of Nature's noblemen. Erect, dignified, always immaculately groomed, courteous, even courtly in his bearing, kindly, sympathetic and tolerant in his dealings with others, whether of high or low degree, he invited their confidence and commanded their respect. He was, withal, one of the most modest of men.

Love of music was the one enduring passion of his life. A brilliant pianist and organist, a fine baritone singer, no mean composer, he found in music rest when weary, relaxation when overwrought, exaltation when depressed, consolation when in sorrow, soothing and contentment at all times. It was but natural that, in his professional career, he should discover in music a potent remedy for the relief and cure of those who were ill in mind.

Born in Worcester, July 25, 1856, educated in the public schools, prepared for college in Worcester High school, he entered Brown University in 1875 with the class of '79. After receiving his A.B. he began the study of medicine and won an M.D. from Jefferson Medical School in 1882. Locating in Providence, he engaged in private practice, but, after two years, followed his natural inclination and took up institutional work at Danvers State Hospital where, as Assistant Physician, he laid the broad and deep foundations of his knowledge of psychology and psychiatry.

In 1894 he was selected for the position of Medical Director at the Bridgewater State Farm where many insane criminals were confined. During his four years stay at Bridgewater he was chiefly instrumental in converting it from a purely custodial penal institution into a true hospital, under the name of Massachusetts State Asylum for Insane Criminals, of which he became Superintendent.

Dr. Harrington returned to Danvers as Superintendent in 1898, retaining this position until 1903, when he resigned. On the death of Dr. W. A. Gorton in May 1899 he had been offered, but declined, the superintendency of Butler Hospital. Both at Danvers and at Bridgewater he had gained much practical experience in planning, designing, constructing and furnishing buildings for the insane which was to be of incalculable value to him in after years.

Immediately after leaving Danvers, Dr. Harrington became Superintendent of the New York Eye and Ear Infirmary where his business ability, sound practical judgment and strong commonsense enabled him to eliminate in one year the deficit under which the hospital had been laboring, which had threatened to cause the closure of the whole institution with the exception of the outpatient department.

Life there was comparatively easy but it was not Dr. Harrington's chosen field, so when an opportunity offered for a return to Psychiatry as Superintendent of the Rhode Island State Hospital for the Insane, he was prompt to seize it. He accepted the position with his eyes open to its difficulties, with no illusion as to what was before him. He must have felt much as did Hercules when confronted with the task of cleansing the Augean stables, but he had always before him a vision of what the hospital *could* be and what he hoped to make it. He accepted the appointment as a challenge to his mettle and endurance.

When he assumed charge at Howard, the institution was almost wholly custodial and was viewed with dread and aversion by possible patients and their families. The meagre support it received from the State was grudgingly given. Its physical plant was wretched. There was but one modern building, the Congregate Dining Hall. Most of the rest were 40 years old, one story, wooden pavilions, without underpinning, cold draughty, unsanitary in the extreme. The few brick wards, in which many patients were locked in their rooms at night, had no masterlocks; in case of fire the attendants would have had to go down the long corridors, unlocking each door separately, to release the imprisoned patients. It was God's mercy that the State had for so long escaped a terrible holocaust. As if these conditions were not, in themselves, bad enough, there was great overcrowding.

With such a plant, the morale was inevitably low; there could be no esprit-de-corps on the part of physicians or attendants. Patients were com-

mitted by the courts under the same form or procedure employed with criminals. Day by day they were admitted; but no histories were taken, no records worthy of the name were kept, no clinics for examining, discussing or diagnosing cases were held. Orders were given to allow no public officials, legislators, nor physicians to go about on the wards for fear of their starting an investigation.

All this was changed as rapidly as possible but the march of improvements was necessarily slow. Legislators, state officers, city officials and the whole Rhode Island Medical Society were invited out to Howard and conducted over the plant, often by Dr. Harrington himself, in order to show them how inadequate, behind the times and positively bad the conditions were. An up-to-date card index and systematic records were established, and clinics, which all the doctors were required to attend, were regularly held. Publicity and tireless, tactful diplomacy were brought to bear on the legislature and the old State Board of Charities and Corrections; but appropriations came in driblets. Progress, however, has been made. The morale and discipline both of physicians and attendants were infinitely improved. The decrepit wooden shacks were torn down as rapidly as the old brick wards could be remodeled, renovated and modernized to house the patients. They were always overcrowded so that hundreds were obliged to sleep on cots and mattresses on the floors in the open wards, which fact was fully publicized by Dr. Harrington in the daily papers.

It was at this time of stress and hard work with meagre results that Dr. Harrington told the writer, quite casually, that he had received an invitation to go back to one of the Massachusetts hospitals, an institution fully equipped and in good running order, where the remuneration was much higher. On being asked whether he would accept the offer, he said, "No, I came here to build up this hospital and my work isn't finished yet." He never again alluded to the subject.

The first *new* building to be constructed was the Reception Hospital, which was opened in May, 1912. Dr. Harrington had taken the leading part in planning it; had visited many other institutions in search of new ideas. The result was a building so completely arranged throughout that psychiatrists and building committees from other States came to Howard in search of information and guidance in building. For the first time since returning to Rhode Island Dr. Harrington had something in which he could take pride. He had shown his skill and imagination in remodelling old buildings so as to secure the greatest possible housing capacity, but the Reception Hospital was different; it was *new*, it was a *creation*.

One feature of the new building was a well-appointed and well lighted operating room; there had been none of any sort previously. Dr. Harrington organized a voluntary staff of surgeons and specialists who responded at any time to calls for aid. In the basement he installed a well-furnished laboratory, and a complete outfit for physiotherapy. It was at this time (about 1912) that the training school for nurses was started, with the double purpose of improving the nursing personnel of the hospital itself, and providing competent care for nervous and mental cases in the community.

In 1916 one of the old brick structures was remodeled into an administration or office building, which, with its substantial furnishings and separate offices for the Superintendent and his assistants created a much more business-like atmosphere and seemed quite palatial compared with the old makeshift quarters. Sorely as new dormitories were needed, none were built until 1928.

Apathy and indifference on the part of the legislature could defer the material part of the Superintendent's program, but in the finer, more spiritual essentials, great progress was being made. At his suggestion the title of the institution was changed from State Hospital for the Insane to State Hospital for Mental Diseases; a small matter, one might think, but of tremendous psychological significance to patients, their friends and the public. It removed at once much of the stigma attached to being treated within its walls.

A State-wide social service was initiated. Clinics were held for the examination of positive or borderline cases, at Pawtucket, Westerly, and other places from time to time, thus beginning a service roughly similar to that now conducted in the Psychopathic Department of the Charles V. Chapin Hospital.

Occupational therapy in all its forms was introduced, adapted in each case to the capacity and needs of the individual.

For years a small orchestra had furnished music at noon and night in the Congregate Dining Hall where one thousand men and women, on opposite sides of the hall, ate together. Great care was taken to see that the music program was progressively quieting and soothing.

Dr. Harrington, with his love and intimate knowledge of music, had long felt that, properly directed, it could be made a powerful therapeutic agent in treating the insane. He now had a wonderful chance to test his theory.

Believing from early experience that technical instruction in music would be of little interest or value to the great majority of his patients, he devoted all his attention to mass or chorus singing. For several years he personally directed the work. Begun with a small, selected group, hardly any of whom could read music, his new departure was hailed with delight by the singers, and doctors and nurses noted in many of them marked improvement in their mental and emotional attitudes. Snatches of song began to be heard upon the wards and about the grounds. The number in the choir, which was made up exclusively of patients, increased gradually until it reached about fifty, both men and women. The institution came to be spoken of as the "singing hospital." With the choir as leaders, many of the inmates joined in with the result of producing such a volume of spontaneous, heartfelt congregational singing as is seldom heard. Every one of the thousand patients who could sing, joined in.

When the burden of training the choir, in addition to all the Superintendent's other duties became too heavy, the Penal and Charitable Commission was prompt, in view of the results obtained, to appoint a musical director.

It became the rule after meals on Sundays and holidays to hold the whole congregation in their places for an hour of song.

The Congregate Dining Hall is both large and lofty and the little four-piece orchestra was pitifully inadequate to lead such a volume of sound. Dr. Harrington felt the need of a powerful pipe-organ and determined to have one. With the ready consent and cooperation of the State Public Welfare Commission, he set out to raise the $10,000 needed without calling upon the state treasury for aid. October 15, 1925, the whole choir was taken down to the WJAR studio to broadcast a concert while Dr. Harrington made his first radio appeal for contributions from the public. It was a great evening in the lives of the singers, most of whom had not seen the city for many a day.

The drive for funds was successful and a fine, large and thoroughly modern pipe organ was purchased and installed in the singers' balcony. Dr. Harrington's pamphlet entitled "The Story of the State Hospital Pipe-Organ" aided very materially in the campaign. So widely diffused in the pyschiatric world was the news of these achievements in musical therapy that Dr. Harrington was invited to participate in a "conference and discussion on painting, drawing and sculpture produced by patients in a mental hospital," which was to be held at Paris, France, in 1930. He responded with a masterly paper entitled "Music as a Therapeutic Aid in a Hospital for the Insane," which was translated into French and published in "Archives Internationales de Neurologie" in Paris.

The organ was dedicated Sunday, May 16, 1926 with brief literary exercises and a fine musical program.

In October, 1926, with everything at the Hospital running smoothly, Dr. Harrington, having passed his seventieth birthday, resigned, but was at once made Superintendent Emeritus and retained, and frequently called into service as a consultant.

He continued to be active in the Rhode Island Society for Mental Hygiene of which he was a founder and past president, and in the Rhode Island Medico-Legal Society. He was on the active staff of the Psychopathic Department of the Charles V. Chapin Hospital. He contributed many papers, mostly on the housing, care and treatment of the mentally ill, to various technical journals.

His memberships included the Providence Medical Association, the Rhode Island Medical Society, of which he was a past president, the American Medical Association, American Psychiatric Association, New England Society of Psychiatry (past president), Boston Society of Psychiatry and Neurology, R. I. Society of Neurology and Psychiatry (past president), The University Club, and D.K.E.

He is survived by a son, Dr. Clifton W. Harrington of Everett, Mass., and a daughter, Mrs. Ethel St. John of Shrewsbury, Mass.

Ironically enough, the vision which years of planning, working and hoping had not been able to materialize, was made real by a major depression accompanied by much human misery and the loosening of Uncle Sam's purse strings. Dr. Harrington lived to see and take part in the erection of the finest and most complete plant of its kind in the country. Twenty-two new buildings, covering almost every possible need, were constructed.

Sunday after Sunday for many months Dr. Harrington had sat down with Dr. Arthur P. Noyes, the superintendent, picturing and planning the new hospital plant as he would have built it if he had

been given the opportunity. No detail was too small to be considered as they discussed and drafted plans for the new institution which Dr. Harrington had long envisioned.

"So when the State was given, suddenly and petulantly, by the Federal Government, two weeks in which to present plans for the use of a previous four million dollar gift to the State, or the sum would be withdrawn, architects were pressed into service under Dr. Harrington's urging. Only with all the earlier forethought and then the instant decision and carrying through could the twenty-two buildings have become possible." This incident was typical throughout of Dr. Harrington's foresight and initiative.

* * * * *

With comparative leisure after his retirement came the opportunity to realize some of his life's ambitions. In 1928, together with the writer, he enjoyed a long-deferred three months' tour of Europe.

No one, not even his closest friends, had dreamt that this busy, practical, hard-headed executive and psychiatrist had in his mind poetical visions and fantasies which he longed to record in verse. His theme had gradually taken shape; his imagery was borrowed in part from old Norse mythology. As the work grew it became a sequence of four poems in heroic verse, which were to be accompanied by some twenty interpretative musical scores. The title of his work is "Everlasting Life." Beginning with the Ice Age it tells the whole story of the origin of life on this planet and its annual ebb and flow with the recurring seasons. The text was completed recently but when Dr. Harrington died there still remained some pages of the music to be written.

Death came just as he would have had it. For about three years his health had been failing and he had made several stays in the hospital. This winter especially he had been out comparatively little, but for two weeks preceding the end he had been feeling well and happy.

On Sunday, March 12, Dr. Harrington had been about the house and in good spirits all day. In the early evening, after reading his completed poem to some friends in the house, he sat down at the piano and began playing one of his own scores, but had played only a few bars when he complained of feeling sick, lay down upon his bed and in two or three minutes passed away. He had really died at the piano with his beloved music.

No pain, no suffering, no lingering sickness. Just Rest and Peace!

MEMORIAL HOSPITAL

REPORT OF A CASE OF DISSECTING ANEURISM OF THE AORTA

JOHN F. KENNEY, M.D.
209 BROADWAY, PAWTUCKET

Name: Mrs. G. G. S.
Occupation. Housewife.
Age: 40.
Admitted. October 1, 1938.
Discharged. October 13, 1938.
Condition on discharge. Dead.
Revised diagnosis: Dissecting Aneurysm of the Aorta.
Pregnancy: Abnormal, low forceps, vertex, R. O. A. (normal female infant).

The patient was admitted to the admitting office with the following history:

Chief complaint: Substernal pain.

Present illness: Patient is a 40 year old primiparous gravida II, mother of one eight year old boy who is living and well, born spontaneously at full term. Patient is now believed to be nine months pregnant.

Pregnancy has been apparently normal and uneventful until today.

Patient ate a large relatively undigestible meal at noon today and was apparently perfectly comforable until 6:00 P. M., when she suddenly became aware of severe pain, starting in head and travelling rapidly down neck to substernal area. There was a sensation of severe choking and substernal pressure, vomiting occurred five to six times, producing portions of the noon meal. Patient was unable to lie or sit down due to dyspnea. There was a sensation of increased gas on stomach with some relief by belching. No history of gastro-intestinal or cardio-respiratory symptoms.

Family history: Mother dead ? cause. Father living, paralysis in both legs for ten years. One sister living, at mental hospital. One brother died, rheumatic fever. No known history of diabetes, cancer, tuberculosis, cardiac, renal, gastro-intestinal or vascular disease.

Marital history: Nine years. Husband living and well, age 50. One child living and well.

Past history: No known history of severe illness or fracture. Amputation of both small toes for hammer toe, 25 years ago. Nocturia x 3. Frequency every 2 hours. Fluid intake and food intake large. No dysuria, incontinence or hematuria.

Catamenia: 26-30 days/5 days/moderate flow with some discomfort. Last period January 1, approximately.

Habits: No alcohol; no tobacco; no medicine.

Physical examination: Abnormally large skeletoned white female, age 40, showing dyspnea, cyanosis, orthopnea, marked apprehension, restlessness,

cold dry skin and complaining of severe substernal pain. Abdomen is enlarged, consistent with a nine months' pregnancy.

Heart: Not enlarged, slow and regular. Blowing systolic and diastolic murmurs over the entire precordium, loudest over second right and third left interspaces. No friction rub heard.

Lungs: Clear and resonant throughout with equal bilateral respiratory excursion.

Abdomen: Enlarged, symmetrically consistent with 9 months pregnancy. Patient complains of substernal pain but exhibits no mid-epigastric tenderness or splinting.

Progress notes: Patient was given morphia gr.¼ and atropine 1/150 s. c. stat. and admitted to the Obstetrical Ward with the diagnosis of coronary occlusion and medical service to follow case with obstetrical service. Dr. John G. Walsh from the Obstetrical Service examined the patient, pronounced patient's condition very grave and should be given expectant treatment regarding her pregnancy. Blood pressure on admission was 50/30.

An electrocardiogram taken on October 2, 1938. No definite conclusion of coronary could be made. An electrocardiogram taken October 5, 1938, showed a diphasic Q. R. S. and an inverted T-4, rhythm regular, rate 90.

Complete electrocardiogram on October 6, 1939:

Rate approximately 140.

Rhythm essentially negative but slight variation due to tacchycardia.

P. R. .14
Q. R. S. .04
Q. R. S. I diphasic
Deep Q I
T I inverted with tendency to high take-off.
T 2 plus minus
T 3 plus
T 4 plus

Comparison with the previous tracings showed further change, essentially inversion of T-wave in lead I with prominence of Q I. Also a marked increase in rate. Findings were definitely consistent with coronary occlusion.

Blood count on admission: Hgb. 65%, R. B. C. 4,400,000, W. B. C. 16,500, Neutrophiles 91%, Lymphocytes 8%, L. M. 1% Repeated blood counts showed essentially no change in the hemoglobin or red cell count; the white count dropped to 10,000.

Blood Chemistries:

		10/3/38	10/11/38
Urea Nitrogen	mg. per 100 cc	29.42	53.71
Creatinine	mg. per 100cc	2.0	1.9
Sugar	mg. per 100 cc	81.	133.

Wassermann was negative for cholesternized and acetone antigens. Hinton was negative. Urinalysis on admission was light yellow; acid; specific gravitiy 1.024; three plus albumin; negative sugar and acetone; sediment two plus leucocytes, one plus R. B. C., two plus hyaline casts. Daily urine examinations remained approximately the same as the original specimen.

October 2, 1938: Patient appeared in less distress than when admitted. She appeared to be very restless and talkative.

October 4, 1938: It was difficult to keep the patient quiet. She appeared to be very uncooperative. Hearts sounds of fair quality and a double murmur which had not changed intensity of character.

October 6, 1938: A portable examination of the chest showed the entire right lung field to present a hazy mottled appearance. These changes were also present in the left upper lung, whereas, the left lower lung field presented a more homogeneous haziness. The heart was apparently considerably enlarged. The findings were consistent with congestive changes in the lungs with possibly a small amount of fluid at the left base associated with a large dilated heart. A portable examination of the abdomen showed marked gas distension of the small and large intestine. The pelvis, however, showed no gas collections and presented a homogeneous shadow which possibly corresponds to a postpartum uterus.

October 6, 1938: The patient delivered with a maximum of four hours labor; low forceps used to hasten delivery. Cyclopropane and ether used during the second stage. Patient appeared to be in considerable distress. However, within a half hour after delivery, she appeared somewhat improved and about as well as before the onset of labor.

October 8, 1938: Portable re-examination of the chest showed congestive changes throughout the right lung field. The changes appeared to be slightly more marked now in the right upper lobe, whereas, the right lower lobe appeared to be somewhat better aerated. The left chest showed a slight but distinct clearing, although the costophrenic sinus was still obscured. The heart was still enormously dilated.

October 9, 1938: Apparently no improvement. She presented moderate edema beginning at the ankles and legs. The dyspnea was somewhat increased. Patient had been complaining of gas in the stomach whenever she took any small amount of liquid.

The temperature was 99 on admission, remained about the same and dropped to subnormal, 97. For two days after delivery remained between that and 98 and two days preceding death elevated to 101.

The pulse was 80. After the third day, it rose to 100 and on the 9th day rose to 130, and remained between 110 and 130 until death.

The respirations averaged from 25 to 30 throughout the course.

The blood pressure on the second day after admission went up to 120/70, remained approximately at this level until the date of delivery and then dropped to 80/30; then went up to 130/60 and the day preceding death, the blood pressure was 110/45.

On the evening of October 12, 1938, the patient's condition became very poor, went into coma and died at 3:45 A. M. the following morning.

An autopsy was performed on October 13, 1938. Autopsy notes are as follows: "Body is that of a large white female exhibiting an unusually large skeleton. The hair is light brown in color, fine in texture and plentiful. The skin on the face has almost an icteric tinge. The skin of the body is pale white. There is a marked blotchy appearance to the upper one-third of the chest and generalized dependent lividity. Rigor mortis is moderately generalized. Pupils are markedly dilated. Lips are cyanotic. The breasts are firm, somewhat pendulous, not abnormally large. The abdomen is symmetrical and protrudes in the midline both above and below the umbilicus. There is no abnormal tympany or dullness. There is a four plus edema of both ankles extending half-way up the lower leg. The small toe on each foot is missing. There is a signet ring on the ring finger of the right hand and a wedding ring on the ring finger of the left. Y-shaped incision extending from both clavicles to the sternum thence to the symphysis pubis was made revealing one inch of bright lemon-colored fat. The abdominal organs were seen to be distended especially the colon. The uterus was subinvoluted extending about 3 fingers above the symphysis in the midline. Upon opening the pleural cavity a right hydrothorax was noted in which there was approximately 500 cc of clear watery-like fluid. There was no noted fluid in the left pleural cavity. Both lungs were normal greyish-red in color. Upon examination of the right lung, it was noted that the lung was heavy. There were no areas of consolidation. However, upon section and gentle pressure, a frothy fluid exuded from the cut surface. This fluid was generalized both in the base and the apex. The left lung was also very heavy. There seemed to be an area of compression at the lower lobe due to pressure from the heart. Upon section at the left base, the same frothy fluid noted in the right lung exuded. The right apex was clear. Heart: The heart was enormously dilated both on the right and the left side, the apex lying mostly in the axilla. The heart was removed in the ordinary manner, the pericardium being opened revealed 100 cc of clear strawcolored fluid. The right and left ventricles are now seen to be markedly dilated. There is a marked visible dilatation at the base of the heart, an area about the size of a fist, which appears like an auricle. There are punctate hemorrhages into its entire wall. Upon opening the heart, marked dilatation of the pulmonary artery was noted with some antemortem adherent clots attached to one of the leaflets of the pulmonary valve with an abundant postmortem clot propagated upon the end of the antemortem clot. The right ventricle is markedly dilated. The surfaces are smooth. There is no evidence of infarct of any of the muscle walls. The left ventricle is markedly dilated. Upon opening it, a clear smooth, shiny surface is revealed. The mitral valve is markedly dilated and all along its surface are small greyish vegetations, evidence of an old rheumatic condition. The aortic valve is dilated and from under the surface, on the aortic side, of one of the cusps appears an antemortem clot which when removed revealed a small opening. A probe was inserted into this opening and revealed it leading to a large saccular dissecting aneurysm about 3½" in length. About 1½" up the aorta appeared a transverse slit on the internal wall of this aneurysm where it had ruptured inward. Upon exploration of the aneurysm, it was found to extend up the right subclavian artery for about 2½" where it ended in a blind pouch. Upon exploration around and downward over the arch of the aorta, it was found that this dissecting aneurysm went along posteriorly all the way to the branching of the common iliac. There is present throughout the aneurysm an organized antemortem clot which is adherent to the wall on all sides. Upon examination of the aorta below the diapragm it was found that there was an area about 7" in length in which there is an almost continuous arteriosclerotic plaque. This material gives the appearance of being calcified but the aorta itself is very friable. The coronaries were examined and there is a small plug in the lower end of the left coronary with a graying of the external surface of the heart muscle. It was concluded that there was not a complete occlusion but rather a marked narrowing. Spleen is enlarged slightly. It cuts with moderate resistance. The surface is dark red in

color. The normal markings are present throughout. Liver slightly enlarged in size, of normal color and upon section reveals no gross pathology. Intestines markedly dilated but no gross pathology is noted. Pancreas negative. Adrenals negative. Kidneys: The right kidney appears somewhat enlarged and upon its surfaces are two cysts, one reddish color and the other pale. Upon opening of the cysts, gelatinous material exuded. The cortex is of normal thickness. The markings of the kidney are well seen. The left kidney is somewhat enlarged. The capsules strip easily and, upon sectioning, reveal some sclerotic changes. Uterus large, and firm, being in the state of involution. The right uterine tube is distended. Upon the posterior surface of the uterus, there is a large area of dilatation of the veins with hemorrhages extending on each side into the broad ligament. Upon sectioning it, the muscle wall of the uterus shows no gross pathology.

Anatomical Diagnosis

1. Dissecting Aneurysm of the Aorta.
2. Coronary Sclerosis.
3. Right Hydrothorax.
4. Pulmonary Edema.
5. Arteriosclerosis of the aorta and both kidneys.
6. Pericardial Effusion.
7. Old Rheumatic Infection of the Heart.
8. Antemortem Thrombus of the Pulmonary Artery.

Knowing that Dr. Burton E. Hamilton of Boston was very much interested in this type of case, Dr. Walsh asked his opinion and after seeing the case agreed that this was possibly a coronary occlusion with the possibility of an aneurysm and has since reviewed the entire case, autopsy, and with particular reference to the electrocardiogram gives the probable explanation that there was a partial obstruction of the left coronary and that possibly a large quantity of the patient's blood went into the aneurysm, therefore, out of the circulation, severe hemorrhage producing a relative coronary circulation insufficiency.

Cases in the literature of aneurysm developing during pregnancy are not very common. Dr. Hamilton called my attention to a report by Dr. T. Shennan on "Dissecting Aneurysms" of the Medical Research Council of London.

There are several features recommending the reporting of this case in full: (1) the observation of the patient by the visiting men and by the Out Patient Department monthly; (2) the sudden onset; (3) the age of the patient; (4) the fact that she was not hypertensive or syphilitic; (5) the ability to go through labor and obtaining a live child; (6) and that in the postmortem examination, there was found an aorta so friable that it is almost impossible to conceive the fact that it had not ruptured entirely down to the pelvis.

RHODE ISLAND SOCIETY FOR NEUROLOGY AND PSYCHIATRY

The Rhode Island Society for Neurology and Psychiatry met April 10, 1939, at the John M. Peters House, Rhode Island Hospital. The meeting was called to order by the President, Dr. Walter C. Weigner, at 8:40 P. M. The minutes of the last meeting were read by the Secretary and approved. The Secretary reported to the Standing Committee recommending the applications of Dr. Lawrence A. Senseman and Dr. Charles Rupp for membership in the Society. It was moved and voted that the report of the Standing Committee be accepted and that Dr. Senseman and Dr. Rupp be elected members of the Society. There being no other business the clinical program for the evening was presented.

Dr. E. F. Gildea presented the "Relationship of Vitamin Deficiencies to Neurological and Psychiatric Problems." Dr. Gildea discussed some of the important conditions arising from lack of Vitamins in diet, stressing particularly treatment. He pointed out that it is necessary to check the actual food eaten rather than the apparent diet; that in severe conditions the dose of vitamin may need to be huge in order to get results, as 20cc. of liver extract five times a day in certain cases of pellagra. In some types of diet to which the patient may be accustomed it seems that the higher the number of calories taken the greater the amount of vitamin necessary, particularly in cases of large amounts of "purified" grains. He pointed out that where the "B Complex" is lacking it may be necessary to use all known members of the "complex" to get results. Several case histories were given illustrating technique in management. The presentation was followed by general discussion after which Dr. Gildea replied to questions presented by members present.

Dr. P. W. Preu of Yale Medical School of New Haven presented a paper on "Sypmtomatic Psychoses with Special Reference to Bromide Intoxications." General discussion followed the presentation and was closed by Dr. Preu.

The meeting was adjourned at 11:10 P. M.

Respectfully submitted,

NILES WESTCOTT, M.D., *Secretary*

OBITUARY

DANIEL S. LATHAM, M.D.

Dr. Daniel S. Latham, a member of the Providence Medical Association, died of a heart attack at his home, 678 Park Avenue, Auburn, on September 21, 1938.

Dr. Latham, the son of Samuel Dexter Latham and Mary Ellen Stevens Latham, was born in Auburn, Maine, January 4, 1867. He was educated in the public schools of Portland and Falmouth, Maine, and graduated from Bowdoin Medical College in 1893, interning at Rhode Island State Institutions, 1893-4. In October, 1894, Dr. Latham located at Auburn (Cranston), R. I. On December 24, 1895, he was married to Margaret E. Moulton of Falmouth, Maine.

From June, 1899, to January, 1912, Dr. Latham served as Health Officer. In January, 1915, he was again reappointed and remained in office until his death.

Dr. Latham was a member of the Rhode Island House of Representatives in 1907 and a member of the Rhode Island Senate, 1908, 1909, 1910. From January, 1908, to April, 1936, he was Medical Examiner, District 2, County of Providence.

At the time of his death he was Superintendent of Health, City Physician, and Director of the Cranston Bureau of Milk Inspection.

Dr. Latham was a member of Deering Lodge, A. F. & A. M., Portland, Maine; Presumscot Lodge, I. O. O. F., Falmouth, Maine; Wayland Lodge, N. E. O. P.; American Medical Association; American Public Health Association; Rhode Island Medical Society; Rhode Island Public Health Association; Health Guild of America; Providence Medical Association; Rhode Island Medico-Legal Society (Past President); Providence Clinical Club (Honorary Member); Children's Friend Society of Providence; Cranston District Nursing Association.

As Medical Examiner for more than twenty-five years he was regarded as one of the ablest in the State. He was a witness in some of the most notable murder cases tried in the Rhode Island courts.

Dr. Latham was a general practitioner of medicine for forty-four years, doing an extensive practice in addition to his numerous public duties. He was very much beloved by his patients and a host of good friends in Cranston and Providence. He was the typical general practitioner of the old school, kind, gentle, and thoughtful with his patients; yet in his capacity as Superintendent of Health and in giving several hours each day of his services to the Board of Health in Cranston, he kept abreast of the time and with the advances in medicine.

He is survived by his widow, Margaret E. Moulton Latham; a daughter, Mildred M. Latham; and a son, Donald S. Latham.

ARTHUR T. JONES, M.D.
P. WILLIAMS, M.D.

BOOK REVIEW

PRECLINICAL MEDICINE, Preclinical States and Prevention of Disease. By Malford W. Thewlis, M.D., A William Wood Book, 206 pages and 24 Pages index, cloth, $3.00. The Williams & Wilkins Company, Baltimore, 1939.

In this book Dr. Thewlis has condensed within 182 pages his views on anthropology as it relates to disease, on preventive medicine, and one early diagnosis and treatment of many important diseases. In other words he has made a bold and original attempt to cover the field of medicine of the future, the maintenance of good health. This type of writing is the most difficult that there is, and if one is inclined to criticise the work in certain details, one should realize that as Dr. Johnson said of the dog walking on his hind legs, "You are surprised to find it done at all."

A comparatively small part of the work is taken up in consideration of types of individuals and the relative susceptibility of these types to certain diseases. This is an extremely interesting study and the author has evidently given it a great deal of thought. The reviewer is not able to pass judgment on the present practical value of this field of observation, but obviously it is very promising for the future.

The material on preventive medicine proper, the field which would be covered in a work on public health, is sound and thorough. Dr. Thewlis emphasizes certain points more than this reviewer would. For instance in tuberculosis he gives especial attention to inherited predisposition and susceptible types. On the other hand he covers adequately the means of transmission of the disease and the significance of the first infection.

He evidently has had a sustained interest in allergy and one wishes that he had been able to use more space on this subject.

The whole book shows great individuality with expression of personal opinions and yet also is obviously based on wide reading and scholarship.

WILLIAM P. BUFFUM, M.D.